
Do pluripotent stem cells exist in adult mice as very small embryonic stem cells?

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Public Summary:

Published reports have indicated that a cell known as the "very small embryonic-like stem cell" (VSEL) can be isolated from bone marrow and is pluripotent—i.e., has the ability to generate all types of tissue in the body. Given that VSELs do not come from the embryo, they could replace embryonic stem cells in research and medicine. However, the claim that they are pluripotent has been incompletely studied. We used methods to isolate candidate VSELs from bone marrow and found that they lacked characteristics indicating pluripotency. Specifically, the cells (1) did not have, in most cases, a sufficient amount of DNA to generate other cells; (2) could not form sphere-like structures that resemble those formed by embryonic stem cells; (3) did not express a gene common to pluripotent cells (i.e., Oct4); and (4) could not generate one type of tissue previously reported: i.e., blood cells. These results provide a failure to confirm the existence of pluripotent VSELs.

Scientific Abstract:

Very small embryonic-like stem cells (VSELs) isolated from bone marrow (BM) have been reported to be pluripotent. Given their nonembryonic source, they could replace blastocyst-derived embryonic stem cells in research and medicine. However, their multiple-germ-layer potential has been incompletely studied. Here, we show that we cannot find VSELs in mouse BM with any of the reported stem cell potentials, specifically for hematopoiesis. We found that: (1) most events within the "VSEL" flow-cytometry gate had little DNA and the cells corresponding to these events (2) could not form spheres, (3) did not express Oct4, and (4) could not differentiate into blood cells. These results provide a failure to confirm the existence of pluripotent VSELs.

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